WHAT IS CLAIMED IS:

1. A manufacturing method of a semiconductor device, comprising:

forming a trench on a surface of a semiconductor substrate;

oxidizing thermally an internal surface of the trench;

forming a first silicon oxide film into the trench with a high density plasma;

removing the first silicon oxide film formed on a side face of the internal surface until a part of the side face is exposed;

oxidizing thermally the part of the side face exposed; and

forming a second silicon oxide film on the first silicon oxide film and on the side face with a high density plasma.

2. The manufacturing method of the semiconductor device of claim 1, wherein said removing includes isotropic wet etching.

3. A manufacturing method of a semiconductor device, comprising:

forming a trench on a surface of a semiconductor substrate;

forming a first silicon oxide film into the trench with a high density plasma;

removing the first silicon oxide film formed on the surface until the surface is exposed; and

forming a second silicon oxide film on the first silicon oxide film and on the exposed surface with a high density plasma.

4. The manufacturing method of the semiconductor device of claim 3, wherein said removing includes chemical mechanical polishing.

5. A manufacturing method of a semiconductor device, comprising:

forming an insulating film on a semiconductor substrate,

forming a polysilicon film on the insulating film;

forming a trench penetrating the insulating film and the polysilicon film and dug in the semiconductor substrate;

forming a thermal oxide film on an internal surface of the trench by a oxidation of an oxygen radical; and

filling a first silicon oxide film into the trench with a high density

plasma.

6. The manufacturing method of the semiconductor device of claim 5, further comprising:

removing the first silicon oxide film formed on a side face of the internal surface until a part of the side face is exposed; and

forming a second silicon oxide film on the first silicon oxide film and on the side face with a high density plasma.

7. A manufacturing method of a semiconductor device, comprising:

forming an insulating film on a semiconductor substrate;

forming a polysilicon film on the insulating film;

forming a trench penetrating the insulating film and the polysilicon film and dug in the semiconductor substrate;

forming a first thermal oxide film and a second thermal oxide film by a thermal oxidation of the semiconductor substrate and the polysilicon film on an internal surface of the trench,

forming a first silicon oxide film on the first thermal oxide film and the second thermal oxide film with a high density plasma;

removing the first silicon oxide film formed on an upper part of the second thermal oxide film; and

forming a second silicon oxide film on the first silicon oxide film with a high density plasma.

8. The manufacturing method of the semiconductor device of claim 7, wherein in said forming the first silicon oxide film, a height of a lowest surface of the first silicon oxide film in the trench is higher than a height of a surface of the insulating film.

9. A semiconductor device comprising:

a semiconductor substrate having a trench on a surface;

a first insulating film identified by a back face contacting with a bottom face and a lower part of a side face of the trench;

a bottom insulator identified by a bottom face and a side face contacting with a surface of said first insulating film;

a second insulating film identified by a back face contacting with

an upper part of the side face of the trench and identified by an end face contacting with an end face of said first insulating film; and

a upper insulator identified by a side face contracting with a surface of said second insulating film and identified by a bottom face contacting an upper face of said bottom insulator.

10. A semiconductor device comprising:

a semiconductor substrate having a trench on a surface;

an insulating film identified by a back face contacting with the surface of said semiconductor substrate and having a first opening on the trench;

a polysilicon film disposed on a surface of said insulating film and having a second opening over the trench;

a silicon oxide film identified by a back face contacting with a bottom face and a side face of the trench and a side face of the second opening of said polysilicon film and identified by an uniform film thickness; and

an insulator identified by a bottom face and a side face contacting with a surface of said silicon oxide film.

11. The semiconductor device of claim 10, wherein an aspect ratio of the trench exceeds three.

12. A semiconductor device comprising:

a semiconductor substrate having a first trench on a surface;

a silicon oxide film identified by a back face contacting with a bottom face and a side face of the first trench;

a bottom insulator identified by a bottom face and a side face contacting with a surface of said silicon oxide film and identified by an upper face having a second trench; and

an upper insulator identified by a bottom face and a side face contacting with the second trench and identified by a height of an upper face being equal to that of an upper face of said bottom insulator.

13. A semiconductor device comprising:

a semiconductor substrate having a trench on a surface;

an insulating film identified by a back face contacting with the

surface of said semiconductor substrate and having a first opening on the trench;

a polysilicon film disposed on a surface of said insulating film and having a second opening over the trench;

a first silicon oxide film contacting with a bottom face and a side face of the trench and a side face of the first opening;

a bottom insulator having a bottom face and a side face coming into contact with a surface of the silicon oxide film;

a second silicon oxide film identified by a back face contacting with said polysilicon film and identified by a surface contacting with said bottom insulator and identified by one end contacting with said insulating film and identified by a height of the other end being equal to that of an upper face of said bottom insulator; and

an upper insulator identified by a bottom face contacting with the other end of said second silicon oxide film and the upper face of said bottom insulator and identified by a side face contacting with a side face of said polysilicon film.